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Reference: Hancock Wind Project avian and bat migration data – reanalyzed for a turbine height of 175 m

First Wind's application to construct the Hancock Wind Project (Hancock) in T16 MD, T22 MD, Aurora, and Osborn, Maine was approved by the MDEP in December 2013. In the application, First Wind proposed either Vestas V112 turbines with a maximum height of 150 m or Siemens 3.0-113 turbines with a maximum height of 156 m. First Wind is considering a third turbine option, Vestas V117 turbines, which would have a maximum height of 175 m.

The increase in turbine height has the potential to change the calculation of targets below turbine height. This memo updates the prior calculations for the expected *maximum* turbine height (156 m) to account for the third turbine option (175 m). Stantec conducted radar migration surveys at the Bull Hill Wind Project (Bull Hill), located 0.7 miles from the nearest turbine at Hancock, in 4 seasons between 2009 and 2011¹. Stantec also conducted raptor migration surveys at Hancock in fall 2012 and at Bull Hill in 3 seasons in 2009 and 2010. Radar migration and raptor migration data from Bull Hill were included in the Hancock application and are incorporated by reference.

This memo summarizes revised survey results of radar data from Bull Hill and raptor data from Hancock and Bull Hill based on a third turbine option.

Nocturnal Migration

Stantec conducted 4 seasons of nocturnal radar surveys at Bull Hill. When calculated considering a maximum turbine height of 175 m, the percent of targets flying below maximum turbine height as reported for the Bull Hill Wind Project increased incrementally for all 4 seasons (Table 1).

¹ At a meeting on 4 September 2012, MDIFW indicated that radar migration surveys and acoustic bat surveys were not necessary at Hancock since surveys conducted at the Bull Hill Wind Project sufficiently captured these data for the area. In later email correspondence, MDIFW recommended raptor migration surveys be conducted at Hancock. First Wind contracted Stantec in fall 2012 to conduct raptor migration surveys at Hancock.

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Table 1. Percent of targets below 2 different turbine heights as detected by radar surveys at Bull Hill from 2009 to 2011.

Season	Seasonal Average Passage Rate (t/km/hr) ²	Seasonal Average Flight Height (m)	Percent Below 156 m	Percent Below 175 m
Fall 2009	614 ± 32	356 ± 9	17%	20%
Spring 2010	387 ± 21	217 ± 8	41%	45%
Spring 2011	519 ± 57	371 ± 3	23%	27%
Fall 2011	431 ± 26	279 ± 2	29%	35%

Percent below turbine height when measured at 175 m for the 2 fall seasons at Bull Hill is within the range of fall results at other projects in the eastern U.S. (1%³ to 40%⁴; Hancock Permit Application Exhibits 7C-2-3 and 7C-4). Percent below turbine height when measured at 175 m for spring 2011 data at Bull Hill was within the range of spring results at other projects in the eastern U.S. (3%⁵ to 38%⁶; Hancock Permit Application Exhibit 7C-4); percent below for spring 2010 (45%) was higher than the range (Hancock Permit Application Exhibit 7C-2-3).

In both fall seasons, fall 2009 and fall 2011, nightly average flight heights on survey nights were all above turbine height. In spring 2010, nightly average flight heights were below turbine height on 9 of 20 nights; average nightly flight height was lowest on May 12 (100 m). The passage rate on this night was 300 t/km/hr and 85% of targets flew below 175 m.

Nightly average flight heights were above turbine height on all but a single night in spring 2011 (May 21); average flight height on this night was 164 m. The passage rate was 739 t/km/hr and 70% of targets flew below 175 m.

Raptor

Stantec conducted 1 raptor migration survey season at Hancock and 3 seasons of raptor migration surveys at Bull Hill. The percent of raptors observed in the project area⁷ and below turbine height⁸ at Hancock and as reported for Bull Hill did not change for any season when calculated for a maximum turbine height of 175 m (Table 2).

² targets per kilometer per hour

³ Sheffield, VT in fall 2004 when measured for a maximum turbine height of 125 m

⁴ Antrim, NH in fall 2011 when measured for a maximum turbine height of 150 m

⁵ Villenova, NY and Laurel Mountain, WV in spring 2007 when measured for a maximum turbine height of 120 m and 130 m, respectively

⁶ Bull Hill, ME in spring 2010 when measured for a maximum turbine height of 145 m

⁷ As defined as those locations within the study area where turbines were proposed

⁸ Percentages expressed as percent of total observations

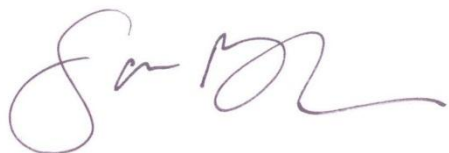
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Table 2. Percent of raptor observations in the project area and below 2 different turbine heights as observed during raptor migration surveys at Hancock in 2012 and Bull Hill in 2009 and 2010.

Season	Seasonal Average Passage Rate (birds/hr)	156 m	175 m
Hancock			
Fall 2012	2.28	26%	26%
Bull Hill			
Summer 2009	0.52	4%	4%
Fall 2009	1.43	47%	47%
Spring 2010	0.53	27%	27%

Percent below turbine height when measured at 175 m for the 1 season at Hancock and 3 seasons at Bull Hill were within the range of results at other projects in the eastern U.S. (20.8%⁹ to 94.7%¹⁰ in fall [Hancock Permit Application Exhibits 7C-2-3 and 7C-6] and 3%¹¹ to 95%¹² in spring [Hancock Permit Application Exhibit 7C-2-3]).

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⁹ Lempster, NH in fall 2005 when measured for a maximum turbine height of 125 m

¹⁰ Dairy Hills, NY in fall 2005 and spring 2005 when measured for a maximum turbine height of 125 m

¹¹ Chateaugay, NY in spring 2006 when measured for a maximum turbine height of 121 m

¹² Buckeye, OH in spring 2008 when measured for a maximum turbine height of 150 m